# COMMUNICATION MANAGEMENT AND KNOLWDGE MANAGEMENT IN COMPLEX PROJECTS: A LITERATURE REVIEW

**JENIFFER DE NADAE**
USP - Universidade de São Paulo

**MARLY MONTEIRO DE CARVALHO**
USP - Universidade de São Paulo

# COMMUNICATION MANAGEMENT AND KNOLWDGE MANAGEMENT IN COMPLEX PROJECTS: A LITERATURE REVIEW

**Resumo**

A complexidade dos projetos pode intensificar o papel da comunicação e do conhecimento da equipe devido ao aumento da necessidade de coordenação e tomada de decisão. Assim, o objetivo deste trabalho é analisar as publicações sobre comunicação, conhecimento em projetos complexos, por meio de uma revisão sistemática da literatura e bibliometria. Para a revisão sistemática da literatura buscou-se artigos utilizando os termos communication* and complex* and project* and knowledge" nas bases de dados da Scopus e *Web of Science*, permitindo analisar os principais autores sobre o tema, tendências de pesquisa e gaps na literatura que possibilitarão desenvolvimento de futuras pesquisas que contribuirão com o tema. Nota-se que a literatura engloba estudos sobre gestão da comunicação nos times dos projetos, mais precisamente sobre armazenagem e compartilhamento do conhecimento em projetos de TI, saúde, física, química, construção, entre outros. Poucos estudos focam em projetos complexos, principalmente analisando os dois tópicos conjuntamente. Assim, com base nos artigos analisados existem poucos estudos que relacionam gestão da comunicação e gestão do conhecimento em projetos e nenhum artigo que relaciona gestão da comunicação e gestão do conhecimento em projetos complexos. Individualmente os temas são estudados por diversos autores, como apresentados nas tabelas e analises deste estudo.

**Palavras-chave**: comunicação; conhecimento; complexo; projeto; bibliometria

**Abstract**

The complexity of projects can intensify the role of communication and team knowledge due to the increased need for coordination and decision making. Thus, the objective of this work is to analyze publications on communication, knowledge in complex projects, through a systematic literature review and bibliometrics. For the systematic review of the literature, articles using the terms communication * and complex * and project * and knowledge "were searched in the databases of Scopus and Web of Science, allowing to analyze the main authors on the theme, research tendencies and gaps in the literature that will enable the development of future research that will contribute to the theme. It is noteworthy that the literature encompasses studies on communication management in project teams, more precisely on the storage and sharing of knowledge in IT, health, physics, chemistry and construction projects, among others. Few studies focus on complex projects, mainly analyzing the two topics together. Thus, based on the articles analyzed there are few studies that relate to communication management and knowledge management in projects and no article that relates communication management and knowledge management in complex projects. Individually the themes are studied by several authors, as presented in the tables and analyzes of this study.

**Keywords**: communication, knowledge, complex, project, bibliometric analysis

**VII SINGEP**
Simpósio Internacional de Gestão de Projetos, Inovação e Sustentabilidade
International Symposium on Project Management, Innovation and Sustainability

ISSN: 2317-8302

# 1 Introdução

Managing project complexity is a critical factor that affects the success of the project (Allen, 2008; Baccarini, 1996). The complexity of the project is usually related to the way in which the design system is modeled Vidal and Marle (2008), thus, different classifications of complex projects are presented in the literature by (Baccarini, 1996, Benbya & McKelvey, 2006; In this paper, we present the results of a study by Chapman and Hyland (2005), which is based on the results obtained by Chapman et al. In this paper, we present the results of the International Project Management Association (IPMA), which is based on the results obtained by the authors of this paper (Kim et al., 2003). , Shinkar and Dvir, 2007, Shenhar, Dvir and Shulman, 1995, Tatikonda and Rosenthal, 2000, Vidal and Marle, These authors propose dimensions that evaluate the complexity of the project.

The complexity of the projects may intensify the role of communication and team knowledge due to the increased need for coordination and decision making (Marks, Mathieu, & Zaccaro, 2001).

For the authors Rabechini Jr., Carvalho and Laurindo (2002) to achieve effective communication, a process of management of the communication system is required, which at the most comprehensive stage is called knowledge management. Alonso et al. (2013) indicate that since knowledge is transmitted primarily through human relations, any noise generates distortions in information, creating barriers to communication and making it difficult to store and share knowledge, thus creating barriers to knowledge management. Thus, it can be stated that many of the barriers present in knowledge transfer are Fukuyama et al. (2015) and the same can also occur.

Therefore, the objective of this paper is to analyze the publications about communication, knowledge in complex projects, through a systematic literature review and bibliometrics. For the systematic review of the literature, articles using the terms communication * and complex * and project * and knowledge "were searched in the Web of Science and Scopus database, allowing to analyze the main authors on the topic, research tendencies and gaps in the literature that future research that will contribute to the theme.

For the accomplishment of the proposed this work is divided into 5 sections. The first one contextualizes the topic addressed. A brief presentation of the concepts is presented in section 2, as well as the search method, search steps in the Web of Science and Scopus database, the analysis software and networks are presented in section 3. The results and discussion on the topic are presented in section 4 and the conclusions in section 5.

**VII SINGEP**

Simpósio Internacional de Gestão de Projetos, Inovação e Sustentabilidade
International Symposium on Project Management, Innovation and Sustainability

ISSN: 2317-8302

## 2. Management of communication and knowledge management in complex projects

The process of communication is influenced by several environmental factors, including location, initiator, a power relation, group size and composition, physical disposition, purpose and time (Johansen & Gillard, 2005). The barriers can occur due to several factors, such as conflicts, distinct cultural environments, lack of feedback, information censorship and inadequate channels (Carvalho & Rabechini Jr, 2015). Alencar, Souza and Viana (2008) reinforce the need to eliminate any types of barriers that hinder communication or impede the clear and objective transmission and understanding of the message.

The geographic distribution of the Teams; Communication and coordination; Integrated systems; Business processes and communication structures can also represent barriers to communication (Bano, Zowghi & Sarkissian, 2016).

Johannessen and Olsen (2011) emphasize the importance of communication in projects, particularly those that are large and complex. They argue that companies must move from the use of communication processes to the use of communication skills during projects.

Knowledge sharing can be viewed as the process of transferring knowledge from individuals, groups or organizations, which may include relevant information, ideas, and skills (Lee, 2001). In terms of knowledge sharing in complex projects, there are two dimensions of knowledge to be addressed: (1) knowledge about the project object, ie the product to be developed and the technical specifications that lead to a project that meets requirements, such as parts, components, parts or assemblies, and / or technologies used; (Santos et al., 2016). In order to achieve this, it is necessary to have a working knowledge of the project and the knowledge and skills necessary to carry out the project.

Cicmil (2005) offers a conceptual framework for capturing knowledge, proposing five aspects of project knowledge: context; content; organizational behavior; communication and project congruence.

Project complexity is the property of a project that makes it difficult to understand, predict, and maintain its overall behavior even when there is reasonably complete information about the project system. The factors related to project size, project variety, project interdependence and project context can help to scale the complexity of a project (Vidal & Marle, 2008).

Different classifications of complex projects are presented in the literature. Baccarini (1996) considers the complexity of the project through the concepts of technological complexity and organizational complexity. While Shenhar, Dvir, and Shulman (1995) distinguish two dimensions of project complexity: "technological uncertainty" and "system scope." Shenhar (2001) extends the framework to encompass three dimensions of project complexity: "uncertainty," "rhythm," and "complexity/scope" where "rhythm" is added to reflect "speed and creativity" of time objectives

Managing a complex project involves several different phases, sometimes overlapping. Many of the available methods, techniques and available project management tools are applied in managing a complex project. In practice, this would mean that more than 60% of project competence elements can be applied to complex projects (IPMA - International Project Management Association, 2006).

VII SINGEP
Simpósio Internacional de Gestão de Projetos, Inovação e Sustentabilidade
International Symposium on Project Management, Innovation and Sustainability
ISSN: 2317-8302

# 3 Method

Due to the objective of the research, a Systematic Literature Review (SLR) was performed to help answer the following research questions: How does the literature relate communication management and knowledge management in complex projects? and What are the main trends in the academic literature on communication management and knowledge management in complex projects?

To obtain an overview of the literature on the subject, the Web of Science and Scopus database were consulted because articles published in indexed and impact factor journals calculated by the Journal Citation Report (JCR) are located on this basis.

The procedures were organized at each stage of the Littell research protocol; Corcoran; Pillai (2008), following three steps: data collection, data analysis, and synthesis. (Tranfield, Denyer; Smart, 2003).

The data collection stage was performed in May 2018, the search was conducted following four steps as shown in Table 1.

Table 1 - Search criteria in the database

| Steps | Database | Scopus | Web of Science |
|---|---|---|---|
| #1 | Search in Article title, Abstract and Keywords: *communication\* and complex\* and project\* and knowledge* | 1404 | 914 |
| #2 | Filter by document type: *Article + Review + Article in Press* | 725 | 492 |
| #3 | Filter by language: *English + Portuguese* | 678 | 461 |
| #4 | Manual filter: reading all abstracts to eliminate out-of-scope articles | 447 | 371 |
| **Final** | | **818** | |

Source: Authors

Applying the filters in step 1 to 3 a manual filter was conducted, all the abstracts were read to remove the papers out-of-scope, articles dealing with health research and education (epidemiological research, animal testing, agricultural research) research on global warming, which deal with complex projects and their relationship to communication management and knowledge management, were removed. Thus, 231 articles were removed from the base of Scopus and 90 from the Web of Science totaling a final agglutinated base (Scopus + Web of Science) of 818 articles. After selecting the 818 articles, the data analysis stage was conducted, merging bibliometrics and systematic review of the literature.

The analysis of the network was carried out using the following software: VosViewer that generated the network of citation of keywords, citation of the main authors. In addition, a descriptive analysis was carried out with the database, generating graphs, through the excel of the countries with the greatest number of publications on the subject, evolution of researches over the years, main periodicals that publish on the subject, the most cited authors, outliers with total citations by authors. Subsequently, content analysis was performed, when the articles searched were classified and coded.

The analysis of keywords is used to highlight concepts associated with the research question, giving greater consistency to the conceptual discussion of sustainable development and performance indicators associated with this theme. Then, the content analysis was conducted based on the summary reading and the last section of each article, called "discussions", "conclusions", "results", among others (Locke & Golden-Biddle, 1997). The

choice of this part of the article is given by the fact that this content often brings a brief summary of the article and also contains the main results of the research. This allows identifying the contribution of each article as well as knowledge gaps.

Finally, the third step, the synthesis of bibliometry was conducted. According to Crossan and Apaydin (2010), this is the step in which more value is added to the bibliometric analysis since this is where the creation of new knowledge is based on the complete and thorough analysis of the data. Emerging insights from the previous two steps brought the material needed to construct a conceptual model through an inductive process.

## 4 Results

The research resulted in a base of 818 articles, with average citations of 16.34 per item. Starting analysis of articles by the number of publications per year (Figure 1), it is noted that the first publication appeared in 1969, and the years 2015, 2016 and 2017 have a larger sum of articles on the subject. The first article dated 1969 was based upon a survey conducted at the Department of Youth Work, University of Manchester, England, in a National Investigation into the Social Adjustment of Deaf Adolescents.

In the year 2015, the studies are focused on projects of innovation, construction and management and health focused on knowledge transfer and translation

As for 2016, the projects are about research projects (health, environmental, sustainability) and software projects and involve learning, communication process, information, and knowledge.

The articles of 2017 and 2018 mostly deal with topics of knowledge and learning, trust and communication, complex projects in IT and health, sustainability in projects and the influence of knowledge and communication on the environmental changes of projects.
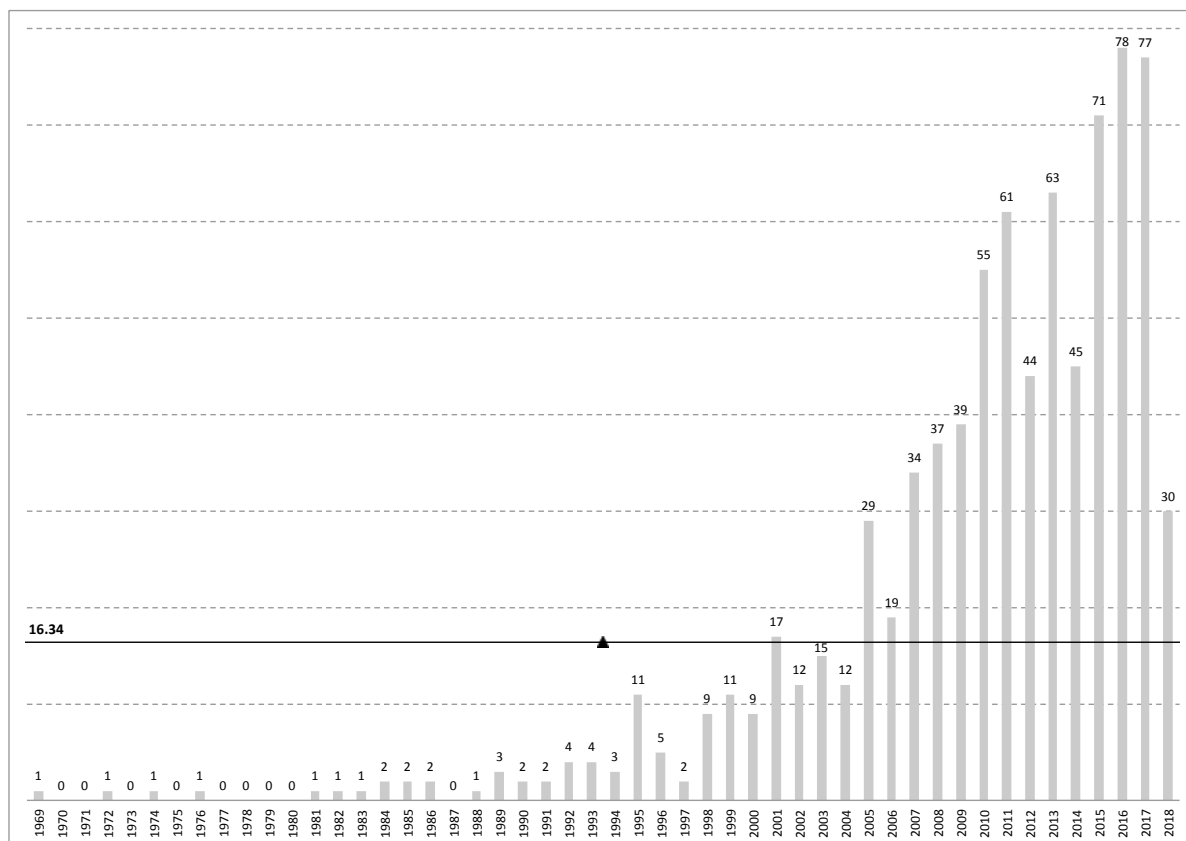


Figure 1 - Publications per year

**VII SINGEP**
Simpósio Internacional de Gestão de Projetos, Inovação e Sustentabilidade
International Symposium on Project Management, Innovation and Sustainability
ISSN: 2317-8302

Table 2 presents the journals with three or more publications on the subject, we analyzed the scope of the journals, highlighting the scope included project management, communication and knowledge management.

The Impact Factor (IF) is a measure of the frequency with which the average article in a journal was cited in a given year. It is used to measure the importance or ranking of a periodical by calculating the hours in which the articles are cited. The calculation is based on a two-year period and involves dividing the number of times the articles were cited by the number of articles that can be cited (Research Guides, 2018).

| Source title | # | IF | PM | C | K |
|---|---|---|---|---|---|
| | | | | SCOPE | |
| Journal of Management in Engineering | 10 | 2.282 | ■ | | ■ |
| Journal of Medical Internet Research | 8 | 4.671 | | | ■ |
| Automation in Construction | 8 | 4.032 | | | |
| International Journal of Project Management | 8 | 4.328 | ■ | | |
| Implementation Science | 7 | 4.345 | | | |
| Journal of Interprofessional Care | 7 | 1.601 | | | |
| International Journal of Medical Informatics | 6 | 2.957 | | ■ | |
| IEEE Transactions On Professional Communication | 5 | 0.756 | | ■ | |
| Trials | 5 | 2.067 | | | |
| Project Management Journal | 4 | 1.957 | ■ | | |
| Journal of Engineering and Technology Management | 4 | 2.686 | | | |
| Research in Engineering Design | 4 | 2.625 | | | |
| BMC Public Health | 4 | 2.420 | | | |
| Computers & Education | 4 | 4.538 | | | ■ |
| Computers in industry | 4 | 2.850 | | ■ | |
| IEEE Transactions on Wireless Communications | 4 | 5.888 | | ■ | |
| Environmental Science and Pollution Research | 3 | 2.800 | | | |
| MIS Quarterly | 3 | 5.430 | ■ | | |
| Journal of the American Society For Information Science and Technology | 3 | 2.452 | | | |
| Information and Software Technology | 3 | 2.627 | | | |
| Journal of Systems and Software | 3 | 2.278 | | | ■ |
| Computers in Human Behavior | 3 | 3.536 | | | ■ |
| Journal of Knowledge Management | 3 | 2.551 | | | ■ |
| AI Edam-Artificial Intelligence For Engineering Design Analysis and Manufacturing | 3 | 1.045 | | | |
| IEEE Transactions On Engineering Management | 3 | 1.416 | | | |
| Electronic Journal of Information Technology in Construction | 3 | - | | | |
| International Journal of Engineering Education | 3 | 0.575 | | | |
| Technical Communication | 3 | 1.188 | | ■ | |
| Technological Forecasting and Social Change | 3 | 3.129 | | | |
| Modern Journal of Language Teaching Methods | 3 | | | | |
| Journal of Digital Imaging | 3 | 1.536 | ■ | | |
| PLoS ONE | 3 | 2.766 | | | |
| Procedia Manufacturing | 3 | - | | | |

IF = Impact Factor / PM = Project Management / C = Communication/ K = Knowledge

Table 2 - Main journals, impact factor and scope

It should be noted that the periodical with the highest number of publications does not necessarily have the highest IF. In this case, the journal with the highest number of publications is the Journal of Management in Engineering (10 papers), but the journal with the largest IF is the IEEE Transactions on Wireless Communications (4 papers).

It is noteworthy that some journals do not indicate their FI and in the classification of the scope, some journals do not emphasize project management, communication, and knowledge management as part of their scope, but they cover the topics: information management and lessons learned that are related to the subject of this study.

Table 2 presents the journals with three or more publications on the subject, we analyzed the scope of the journals, highlighting the scope included project management, communication and knowledge management.

The Impact Factor (FI) is a measure of the frequency with which the average article in a journal was cited in a given year. It is used to measure the importance or ranking of a periodical by calculating the hours in which the articles are cited. The calculation is based on a two-year period and involves dividing the number of times the articles were cited by the number of articles that can be cited (Research Guides, 2018).

It should be noted that the periodical with the highest number of publications does not necessarily have the highest IF. In this case, the journal with the highest number of publications is the Journal of Management in Engineering (10 papers), but the journal with the largest IF is the IEEE Transactions on Wireless Communications (4 papers).

It is noteworthy that some journals do not indicate their FI and in the classification of the scope, some journals do not emphasize project management, communication, and knowledge management as part of their scope, but they cover the topics: information management and lessons learned that are related to the subject of this study.

About the authors keywords, Figure 2, of the 2,512 authors keywords, 50 meet the threshold, a minimum number of occurrences of a keyword is 5. For each of the 50 keywords, the total strength of the co-occurrence links with other keywords is calculated. The keywords with the greatest total link strength will be selected.

Mapping the most commonly used keywords and terms can help searchers in defining search topics in their searches and studies. The VOS Viewer software offers a series of graphical analyzes based on the co-occurrence of the analyzed items (Van Eck & Waltman, 2010).

The system shows the connection between related terms and authors, providing division into groups called clusters. Each cluster is represented by a color and aggregates all items considered similar. The size of the circles of the maps shows the number of occurrence of the item and the proximity between two items reveals their degree of relationship, the closer they are, the more closely related (Van Eck & Waltman, 2010). The more important an item, the greater its writing and its representative circle (Van Eck & Waltman, 2010).
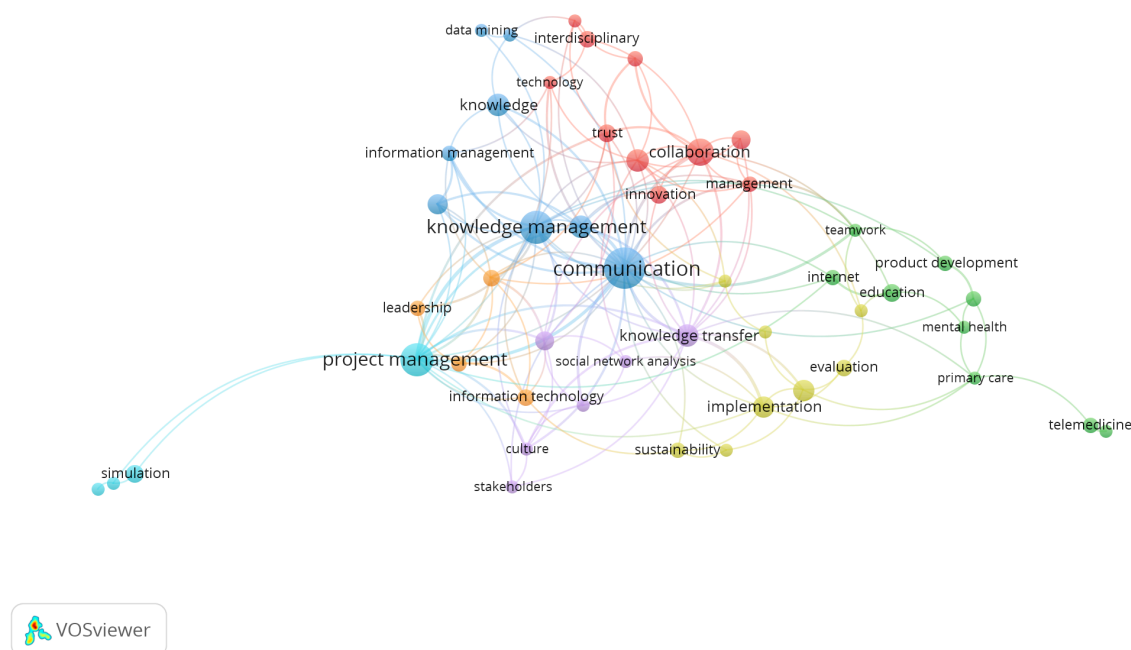


Figure 2 - Co-occurrence of authors keywords

**VII SINGEP**
Simpósio Internacional de Gestão de Projetos, Inovação e Sustentabilidade
International Symposium on Project Management, Innovation and Sustainability

ISSN: 2317-8302

The keywords are grouped into seven clusters and the occurrences are presented in Table 3. A map of terms demonstrates the structure of a scientific field, showing the relationship between important terms in the area. During the selection of the terms, the main topics of the area and the relationship of the terms with them are verified to identify their relevance in differentiating each article (Van Eck & Waltman, 2010).

| # | Clusters | Occurences | Total link strength | # | Clusters | Occurences | Total link strength |
|---|----------|-----------|---------------------|---|----------|-----------|---------------------|
| #1 | collaboration | 20 | 18 | #4 | implementation | 12 | 11 |
| | case study | 7 | 13 | | knowledge translation | 12 | 7 |
| | trust | 8 | 12 | | narrative | 5 | 5 |
| | management | 6 | 10 | | interprofessional education | 5 | 4 |
| | interdisciplinarity | 6 | 6 | | sustainability | 6 | 4 |
| | technology | 5 | 6 | | evaluation | 7 | 3 |
| | participation | 5 | 5 | | participatory action research | 5 | 3 |
| | collaborative design | 10 | 4 | | qualitative research | 5 | 2 |
| | innovation | 9 | 4 | #5 | knowledge transfer | 14 | 25 |
| | interdisciplinary | 7 | 3 | | knowledge sharing | 10 | 12 |
| #2 | teamwork | 5 | 8 | | culture | 5 | 10 |
| | primary care | 5 | 6 | | coordination | 5 | 8 |
| | action research | 6 | 5 | | social network analysis | 5 | 4 |
| | education | 8 | 5 | | stakeholders | 5 | 4 |
| | internet | 6 | 5 | #6 | project management | 29 | 35 |
| | product development | 6 | 4 | | decision support | 7 | 3 |
| | mental health | 5 | 3 | | simulation | 8 | 2 |
| | telemedicine | 6 | 3 | | engineering design | 5 | 1 |
| | knowledge representation | 5 | 2 | #7 | information systems | 7 | 13 |
| #3 | communication | 44 | 47 | | construction industry | 6 | 7 |
| | knowledge management | 29 | 28 | | information technology | 7 | 7 |
| | complexity | 13 | 16 | | leadership | 6 | 6 |
| | information management | 6 | 10 | | | | |
| | design | 11 | 9 | | | | |
| | knowledge | 13 | 7 | | | | |
| | decision-making | 5 | 5 | | | | |
| | data mining | 5 | 2 | | | | |

Table 3 - Occurrence of authors keywords

Cluster # 1 has the word collaboration with greater prominence and link strength and suggests interdisciplinary projects focused on knowledge management as a source of collaboration, participation, team involvement and transmission of trust

Cluster # 2 has the word Education with the highest occurrence suggesting work with research projects in education and health involving knowledge processes. In cluster # 3 the word communication stands out, followed by the word knowledge management both with greater occurrence and link strength, these words besides being related were used in the search for the formation of the database of this research. In addition, the work in this cluster suggests complex IT projects.

Implementation and Knowledge translations are the most prominent words and link strength of cluster # 4 also involve educational research projects and projects involving the sustainability theme in knowledge transfer. In relation to the cluster # 5 knowledge transfer and knowledge sharing are the words with the highest occurrence, this suggests that knowledge management research is related to the transfer and sharing processes, it is worth noting that the work of this cluster highlights the importance of the organizational culture to facilitate knowledge management.

Many of the projects in this base are engineering design and construction industry and this is highlighted in cluster # 6 and cluster # 7, as well as IT projects highlighted in # 7.

# VII SINGEP
Simpósio Internacional de Gestão de Projetos, Inovação e Sustentabilidade
International Symposium on Project Management, Innovation and Sustainability

ISSN: 2317-8302

The dispersion of the scientific production on the theme can also be evidenced by the analysis of the productivity of the 2797 authors present in the sample. Approximately 96% of them published only up to two documents; only ten (4%) published more than two papers during the analyzed period, and are presented in Table 4.

Of the 10 authors, only one has published more than four articles and belongs to the American University. Only one author from China, one from Canada and one from Korea are highlighted in the table because they have three publications on the subject analyzed, with two other residents in England and the rest in the United States.

Three of John E. Taylor's four papers are about architecture, design, and engineering projects, only one deals communication tools in IT project. As for the other Americans, authors Laurie J. Kirsch and William R. King are from the University of Pittsburgh and published an article together on IT projects and knowledge transfer, the other articles of these authors are also from the area of IT. Kalle Lyytinen also studies knowledge management in IT projects and Josh Iorio projects with virtual teams and construction projects.

| Authors | # Papers | Affiliations | Countries |
|---|---|---|---|
| Taylor, J.E. | 4 | Charles E Via Jr Dept Civil & Environm Engn, Virginia Tech | 🇺🇸 |
| King, W.R. | 3 | Katz Graduate School of Business, University of Pittsburgh | 🇺🇸 |
| Reimer-Kirkham, S. | 3 | School of Nursing, Trinity Western University | 🇨🇦 |
| Lee, J. | 3 | Center for Work Science, Yonsei University | 🇰🇷 |
| Li, X. | 3 | Institute of Behavior and Psychology, Henan University | 🇨🇳 |
| Austin, S. | 3 | School Energy Construct & Environm., Coventry University | 🇬🇧 |
| Kirsch, L.J. | 3 | Katz Graduate School of Business, University of Pittsburgh | 🇺🇸 |
| Lyytinen, K. | 3 | Weatherhead School Management, Kalle Case Western Reserve University | 🇺🇸 |
| Iorio, J. | 3 | Civil Engn Network Dynam Lab, Polytech Inst & State University | 🇺🇸 |
| Alshawi, M. | 3 | Research Institute for the Built and Human Environment (BUHU), University of Salford | 🇬🇧 |

Table 4 - Main authors, institutions, and countries

The Korean Jungwoo Lee is studying knowledge sharing in IT projects. The Canadian Reimer-Kirkham's paper together with other authors deals with the transfer of knowledge in health processes and research projects in the health area. In addition, the authors of these papers propose to conceptualize the knower, knowledge, and action are inseparable.

The studies of Chinese Xiaoming Li are about health projects and studies of mechanisms that facilitate knowledge sharing teams. About the British Stephen Austin, his studies are about design projects and a study that analyzes portals as a knowledge repository and transfer tool, and Mustafa Alshawi analyzes construction and IT projects.

| Authors | Title | Source title | #Citation | %Accum |
|---|---|---|---|---|
| Ko, Kirsch and King (2005) | Antecedents of knowledge transfer from consultants to clients in enterprise system implementations | MIS Quarterly: Management Information Systems | 698 | 2,9% |
| Lu, Chang and Liao (2013) | Environmental Informatics for Solid and Hazardous Waste Management: Advances, Challenges, and Perspectives | Critical Reviews in Environmental Science and Technology | 430 | 4,6% |
| Mammela, Riekki, Kotelba and Anttonen (2018) | Multidisciplinary and Historical Perspectives for Developing Intelligent and Resource-Efficient Systems | Ieee Access | 403 | 6,3% |
| Choi and Pak (2006) | Multidisciplinarity, interdisciplinarity and transdisciplinarity in health research, services, education and policy: 1. Definitions, objectives, and evidence of effectiveness | Clinical and Investigative Medicine | 280 | 7,4% |
| Frost and Massagli (2008) | Social uses of personal health information within PatientsLikeMe, an online patient community: What can happen when patients have access to one another's data | Journal of Medical Internet Research | 238 | 8,4% |
| Klaschka (2008) | A new challenge-development of test systems for the infochemical effect | Environmental Science and Pollution Research | 168 | 9,1% |
| Setia and Patel (2013) | How information systems help create OM capabilities: Consequents and antecedents of operational absorptive capacity | Journal of Operations Management | 161 | 9,7% |
| Robbin and FrostKumpf (1998) | Extending theory for user-centered information services: Diagnosing and learning from error in complex statistical data | Journal of the American Society For Information Science | 158 | 10,4% |
| Chini, Canning, Schreiber, Peschel and Stillwell (2017) | The Green Experiment: Cities, Green Stormwater Infrastructure, and Sustainability | Sustainability | 155 | 11,0% |
| Delafield-Butt and Trevarthen (2015) | The ontogenesis of narrative: from moving to meaning | Frontiers in Psychology | 150 | 11,6% |
| Vlaar, van Fenema and Tiwari (2008) | Cocreating understanding and value in distributed work: How members of onsite and offshore vendor teams give, make, demand, and break sense | Mis Quarterly | 149 | 12,3% |
| Licorish and MacDonell (2017) | Exploring software developers' work practices: Task differences, participation, engagement, and speed of task resolution | Information & Management | 143 | 12,8% |

**VII SINGEP**
Simpósio Internacional de Gestão de Projetos, Inovação e Sustentabilidade
International Symposium on Project Management, Innovation and Sustainability

ISSN: 2317-8302

| | | | | |
|---|---|---|---|---|
| Larsen, Eppinga, Passalacqua, Getz, Rose and Liang (2016) | Appropriate complexity landscape modeling | Earth-Science Reviews | 142 | 13,4% |
| Su and Contractor (2011) | A Multidimensional Network Approach to Studying Team Members' Information Seeking From Human and Digital Knowledge Sources in Consulting Firms | Journal of the American Society For Information Science and Technology | 141 | 14,0% |
| Johannsen and Fill (2017) | Meta Modeling for Business Process Improvement | Business & Information Systems Engineering | 138 | 14,6% |
| Westgate, Likens and Lindenmayer (2013) | Adaptive management of biological systems: A review | Biological Conservation | 129 | 15,1% |
| Moenaert, Caeldries, Lievens and Wauters (2000) | Communication flows in international product innovation teams | Journal of Product Innovation Management | 129 | 15,6% |
| Com, Melaine, Chalmel and Pineau (2014) | Proteomics and integrative genomics for unraveling the mysteries of spermatogenesis: The strategies of a team | Journal of Proteomics | 122 | 16,1% |
| Ingram, Mills, Dibari, Ferrise, Ghaley, Hansen, Iglesias, Karaczun, McVittie, Merante, Molnar and Sanchez (2016) | Communicating soil carbon science to farmers: Incorporating credibility, salience and legitimacy | Journal of Rural Studies | 121 | 16,6% |
| Wolf, Arnold, Bauersachs, Beier, Blum, Einspanier, Frohlich, Herrler, Hiendleder, Kolle, Prelle, Reichenbach, Stojkovic, Wenigerkind and Sinowatz (2003) | Embryo-maternal communication in bovine - Strategies for deciphering a complex cross-talk | Reproduction in Domestic Animals | 118 | 17,1% |
| Pons (2008) | Project Management for New Product Development | Project Management Journal | 114 | 17,6% |
| Weimann, Pollock, Scott and Brown (2013) | Enhancing Team Performance Through Tool Use: How Critical Technology-Related Issues Influence the Performance of Virtual Project Teams | Ieee Transactions On Professional Communication | 105 | 18,0% |
| Spink, Hillman, Fryirs, Brierley and Lloyd (2010) | Has river rehabilitation begun? Social perspectives from the Upper Hunter catchment, New South Wales, Australia | Geoforum | 105 | 18,4% |
| Roberts, Cheney, Sweeney and Hightower (2004) | The effects of information technology project complexity on group interaction | Journal of Management Information Systems | 104 | 18,9% |

VII SINGEP
Simpósio Internacional de Gestão de Projetos, Inovação e Sustentabilidade
International Symposium on Project Management, Innovation and Sustainability
ISSN: 2317-8302

| | | | | |
|---|---|---|---|---|
| Smith and Villalba (2008) | Striatal and extrastriatal dopamine in the basal ganglia: An overview of its anatomical organization in normal and Parkinsonian brains | Movement Disorders | 103 | 19,3% |
| Van Ban and Hadikusumo (2017) | Culture EPC oil and gas project in Vietnam: grounded theory | International Journal of Energy Sector Management | 103 | 19,7% |
| Chrysoulakis, Lopes, San Jose, Grimmond, Jones, Magliulo, Klostermann, Synnefa, Mitraka, Castro, Gonzalez, Vogt, Vesala, Spano, Pigeon, Freer-Smith, Staszewski, Hodges, Mills, Cartalis (2013) | Sustainable urban metabolism as a link between bio-physical sciences and urban planning: The BRIDGE project | Landscape and Urban Planning | 103 | 20,1% |
| Kanawattanachai and Yoo (2007) | The impact of knowledge coordination on virtual team performance over time | Mis Quarterly | 103 | 20,5% |
| Kleinschmidt, de Brentani and Salomo (2010) | Information Processing and Firm-Internal Environment Contingencies: Performance Impact on Global New Product Development | Creativity and Innovation Management | 102 | 21,0% |
| SÃ¸derberg and Holden (2002) | Rethinking cross cultural management in a globalizing business world | International Journal of Cross Cultural Management | 101 | 21,4% |
| | | Others (#140) > 50 and ≤100 | 9468 | 60,2% |
| | | Others (#642) ≤ 50 | 9724 | 100,0% |
| | | Total | 24408 | |

Table 5 – Most cited papers

Table 5 shows the most cited papers among those present in the sample of the study. This analysis allows to identify which papers and authors have more influence on the research, although, as discussed, it is still an emerging issue.

The most cited article was written by Ko, Kirsch, and King (2005) and analyzes knowledge management in complex IT projects, this paper examines the antecedents of knowledge transfer in the context of such an interfirm complex information systems implementation environment. Drawing from the knowledge transfer, information systems, and communication literature, an integrated theoretical model is developed that posits that knowledge transfer is influenced by knowledge-related, motivational, and communication-related factors. Data were collected from consultant-and-client matched-pair samples from 96 ERP implementation projects.

## 5 Conclusion

The objective of this work was to analyze publications on communication and knowledge management in complex projects, through a systematic review of literature and bibliometrics. For the systematic review of the literature, articles were searched using the terms communication * and complex * and project * and knowledge "in the Web of Science and Scopus database, allowing to analyze the main authors on the topic, research trends and gaps in the literature which will enable the development of future research that will contribute to the theme. In addition, it was possible to answer the question: How does the literature relate communication management and knowledge management in complex projects? and What are the main trends in the academic literature on communication management and knowledge management in complex projects?

It is noteworthy that the literature encompasses studies on communication management in project teams, more precisely on the storage and sharing of knowledge in IT, health, physics, chemistry and construction projects, among others. Few studies focus on complex projects, mainly analyzing the two topics together. Communication management and knowledge management in complex projects, which according to the theory are projects with difficult understanding and prediction, with complex information, many involved, with interdependence between projects, among other properties that differ from projects, complex projects already presents diverse challenges which include problems with communication and knowledge management.

It is worth mentioning the absence of articles, on the basis used, that analyze the barriers to communication in projects and barriers to knowledge management in projects, mainly analyzing these barriers in complex projects, no studies were found that make this relation. Thus, based on the articles analyzed there are few studies that relate to communication management and knowledge management in projects and no article that relates communication management and knowledge management in complex projects. Individually the themes are studied by several authors, as presented in the tables and analyzes of this study.

The articles of the year 2017 mostly deal with topics of knowledge and learning, trust and communication, complex projects in IT and health, sustainability in projects and the influence of knowledge and communication on the environmental changes of projects. And the most recent articles of the year 2018 deal with the analysis of learning in health projects, communication in sustainable projects, knowledge and interpersonal communication in educational projects, knowledge of politics in megaprojects.

Future research may analyze communication management and knowledge management in complex projects; the barriers and main challenges of complex projects; the differences between communication management in traditional projects and complex projects and the same for knowledge management.

This study confines itself to analyzing only the articles in the Web of Science and Scopus database, other bases could be incorporated and analyzed, as well as articles from other languages.

## Referências

Allen, P. M. (2008). The importance of complexity for the research agenda in the built environment. Architectural Engineering and Design Management, v. 4, n. 1, p. 5–14.

Alonso, L. B. N. *et al*.(2013). Comunicação e compartilhamento do conhecimento entre equipes em automação de processos. Revista Comunicologia, n. 2002, p. 165–183.

Baccarini, D. (1996). The concept of project complexity - A review. International Journal of Project Management, v. 14, n. 4, p. 201–204.

Bano, M.; Zowghi, D. & Sarkissian, N. (2016). Empirical study of communication structures and barriers in geographically distributed teams. IET Software, v. 10, n. 5, p. 147–153.

Benbya, H.& Mckelvey, B. (2006). Toward a complexity theory of information systems development. Information Technology & People, v. 19, n. 1, p. 12–34.

Carvalho, M. M.; Patah, L. A. & Bido, D. S. (2015). Project management and its effects on project success: Cross-country and cross-industry comparisons. International Journal of Project Management, v. 33, n. 7, p. 1509–1522.

Carvalho, M. M. & Rabechini Jr, R. (2015). Fundamentos em Gestão de Projetos: Construindo Competências para Gerenciar Projetos. Atlas ed. São Paulo: 4.

Chapman, R. & Hyland, P. (2004). Complexity and learning behaviors in product innovation. Technovation, v. 24, n. 7, p. 553–561.

Cicmil, S. & Marshall, D. (2005). Insights into collaboration at the project level: Complexity, social interaction and procurement mechanisms. Building Research and Information, v. 33, n. 6, p. 523– 535.

Cooke-Davies, T. *et al.*(2008). We're Not in Kansas Anymore, Toto: Mapping the Strange Landscape of Complexity Theory, and Its Relationship to Project Management. IEEE Engineering Management Review, v. 36, n. 2, p. 5–21.

Crawford, L.; Hobbs, B.&Turner, J. (2005). Project Categorization Systems. Newton Square: PMI.

Figueira, M. M. C. (2017). Identificação de outliers. 1998. Disponível em: <http://www.ipv.pt/millenium/arq12.htm>. Access in: 10 out.

Fukuyama, K. *et al.* (2015). Barreiras à comunicação e suas influências no desempenho de projeto. Mundo PM, p. 1–56.

Geraldi, J. & Adlbrecht, G. (2007). On faith, fact, and interaction in projects. IEEE Engineering Management Review, v. 36, n. 2, p. 35–49.

Geraldi, J.; Maylor, H. & Williams, T. (2008). Now, let's make it really complex (complicated). International Journal of Operations & Production Management, v. 31, n. 9, p. 966–990, 2011. GIRMSCHEID, G.; BROCKMANN, C. The Inherent Complexity of Large Scale Engineering Projects. Project Perspectives, v. 29, p. 22–26.

Green, G. C. (2004). The impact of cognitive complexity on project leadership performance. Information and Software Technology, v. 46, p. 165–172.

He, Q. *et al.*(2015). Measuring the complexity of mega construction projects in China-A fuzzy analytic network process analysis. International Journal of Project Management, v. 33, n. 3, p. 549–563.

Hobday, M. (1998). Product complexity, innovation and industrial organisation. Research Policy, v. 26, n. 6, p. 689–710.

Homer-Dixon, T. F. (2000). The ingenuity gap: Facing the economic, environmental, and other challenges of an increasingly complex and unpredictable world. New York.: Knopf.

IPMA - Internacional Project Management Association. ICB – IPMA Competence Baseline, Version 3.0. [s.l: s.n.].

Johannessen, J. A.; Olsen, B. (2011).Projects as communicating systems: Creating a culture of innovation and performance. International Journal of Information Management, v. 31, n. 1, p. 30– 37.

Johansen, J. & Gillard, S. (2005). Information resources project management communication: Personal and environmental barriers. Journal of Information Science, v. 31, n. 2, p. 91–98.

Kim, J. & Wilemon, D. (2003). Sources and assessment of complexity in NPD projects. R and D Management, v. 33, n. 1, p. 15–30.

Lee, J. N. (2001). The impact of knowledge sharing, organizational capability and partnership quality on IS outsourcing success. Information and Management, v. 38, n. 5, p. 323–335.

**VII SINGEP**
Simpósio Internacional de Gestão de Projetos, Inovação e Sustentabilidade
International Symposium on Project Management, Innovation and Sustainability

ISSN: 2317-8302

Little, T. (2005). Uncertainty. IEEE Computer Society, p. 28–35.

Luo, L. *et al.* (2017). Investigating the Relationship between Project Complexity and Success in Complex Construction Projects. Journal of Management in Engineering, v. 33, n. 2, p. 4016036.

Marks, M. A.; Mathieu, J. E. & Zaccaro, S. J. A (2001). Temporally Based Framework and Taxonomy of Team Processes Author ( s ): Michelle A . Marks , John E . Mathieu and Stephen J . Zaccaro Source: The Academy of Management Review , Vol . 26 , No . 3 ( Jul ., 2001 ), pp . 356-376 Published by: Academy of M. The Academy of Management Review, v. 26, n. 3, p. 356–376.

Mattar, F. N. (2014). Pesquisa de Marketing: Metodologia, planejamento, execução e análise. 7. ed. Rio de Janeiro: Elsevier. 2014.

Müller, R. & Turner, J. R. (2007). Matching the project manager's leadership style to project type. International Journal of Project Management, v. 25, n. 1, p. 21–32.

Mykytyn, P. P. & Green, G. I. (1992). Effects of computer experience and task complexity on attitudes of managers. Information and Management, v. 23, n. 5, p. 263–278.

Rabechini Jr., R.; Carvalho, M. M. & Laurindo, F. J. B. (2002). Fatores críticos para implementação de gerenciamento por projetos: o caso de uma organização de pesquisa. Produção, v. 12, n. 2, p. 28–41.

Santos, V. R. *et al.* (2016*).* Knowledge Sharing Barriers in Complex Research and Development Projects: an Exploratory Study on the Perceptions of Project. Knowledge and Process Management, v. 23, n. 2, p. 110–123.

Shenhar, A. J. (2001). One size does not fit all projects: exploring classical contingency domains. Management Science, v. 47, n. 3, p. 394–414.

Shenhar, A. J. & Dvir, D. (2007). Reinventing Project Management: The Diamond Approach to Successful Growth and Innovation. Boston, MA: HBS Press Book.

Shenhar, A. J.; Dvir, D. & Shulman, Y. A (1995). Two-dimensional taxonomy of products and innovations. Journal of Engineering and Technology Management, v. 12, n. 3, p. 175–200.

Tatikonda, M. V. &Rosenthal, S. R. (2000). Technology novelty, project complexity, and product development project execution success: A deeper look at task uncertainty in product innovation. HPAC Heating, Piping, Air Conditioning, v. 72, n. 2, p. 74–87.

Van Eck, N. J., Waltman, L. (2010). Software survey: VOSviewer, a computer program for bibliometric mapping. Scientometrics, v. 84, p. 523-538, 2010.

Van Eck, N. J., Waltman, L., Dekker, R. &Van Den Berg, J. A. (2010). Comparison of Two Techniques for Bibliometric Mapping: Multidimensional Scaling and VOS. Journal of the American Society for Information Science and Technology, v. 61, p. 2.405-2.416.

Vidal, L. &Marle, F. (2008). Understanding project complexity: implications on project management. Kybernetes, v. 37, n. 8, p. 1094–1110.

Williams, T. (2005). Assessing and moving on from the dominant project management discourse in the light of project overruns. IEEE Transactions on Engineering Management, v. 52, n. 4, p. 497–508.

Williams, T. M. (1999). The need for new paradigms for complex projects. International Journal of Project Management, v. 17, n. 5, p. 269–273.

Williams, T. (2002). Modelling Complex Projects. [s.l.] Wiley, Chichester.

Williams, T. (2007). Post-project reviews. Newtown Square, Pennsylvania: Project Management Institute, Inc.

Xia, W. (2005). Complexity of Information Systems Development Projects: Conceptualization and Measurement Development Complexity of Information Systems Development Projects: Conceptualization and Measurement Development Abstract. Journal of Management Information Systems, v. 22, n. 1, p. 45–83.